



FGA gene

fibrinogen alpha chain

Normal Function

The *FGA* gene provides instructions for making a protein called the fibrinogen A alpha ($A\alpha$) chain, one piece (subunit) of the fibrinogen protein. This protein is important for blood clot formation (coagulation), which is needed to stop excessive bleeding after injury. To form fibrinogen, the $A\alpha$ chain attaches to two other proteins called the fibrinogen B beta ($B\beta$) and fibrinogen gamma (γ) chains, each produced from different genes. Two sets of this three-protein complex combine to form functional fibrinogen.

For coagulation to occur, another protein called thrombin removes a piece from the $A\alpha$ and the $B\beta$ subunits of the functional fibrinogen protein (the pieces are called the A and B fibrinopeptides). This process converts fibrinogen to fibrin, the main protein in blood clots. Fibrin proteins attach to each other, forming a stable network that makes up the blood clot.

Health Conditions Related to Genetic Changes

congenital afibrinogenemia

Mutations in the *FGA* gene can lead to congenital afibrinogenemia, a condition that causes excessive bleeding due to the absence of fibrinogen protein in the blood. Most *FGA* gene mutations that cause this condition lead to an abnormally short blueprint for protein formation (mRNA). If any fibrinogen $A\alpha$ chain is produced, it is nonfunctional. Because this condition occurs when both copies of the *FGA* gene are altered, there is a complete absence of functional fibrinogen $A\alpha$ chain. Without the $A\alpha$ subunit, the fibrinogen protein is not assembled, which results in the absence of fibrin. Consequently, blood clots do not form in response to injury, leading to the excessive bleeding seen in people with congenital afibrinogenemia.

other disorders

Mutations in one or both copies of the *FGA* gene can cause other bleeding disorders known as hypofibrinogenemia, dysfibrinogenemia, or hypodysfibrinogenemia.

Hypofibrinogenemia is a condition characterized by decreased levels of fibrinogen in the blood. This condition is caused by mutations that reduce but do not eliminate the production of the fibrinogen $A\alpha$ chain. People with hypofibrinogenemia can have

bleeding problems that vary from mild to severe. Generally, the less fibrinogen in the blood, the more severe the bleeding problems are.

Dysfibrinogenemia is a condition characterized by abnormally functioning fibrinogen, although the protein is present at normal levels. This condition is usually caused by mutations that change a single protein building block (amino acid) in the fibrinogen A α chain. These mutations alter the function of the fibrinogen protein and, depending on the functional change, can lead to excessive bleeding or abnormal blood clotting (thrombosis).

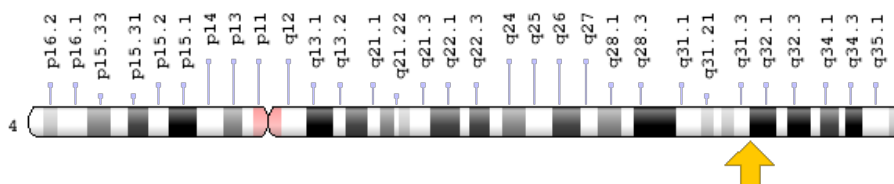
Hypodysfibrinogenemia is a condition characterized by low levels of abnormally functioning fibrinogen protein in the blood. As in dysfibrinogenemia, this condition can result in excessive bleeding or thrombosis.

Mutations in the *FGA* gene are also responsible for some cases of a condition called hereditary renal amyloidosis, which causes impairment of kidney (renal) function and leads to kidney failure. This condition is characterized by the accumulation of protein clumps called amyloid deposits in the kidneys. When the condition is caused by *FGA* gene mutations, the amyloid deposits are made up of abnormal fibrinogen A α chain proteins, and the condition is sometimes called fibrinogen amyloidosis. The mutations involved in this condition typically change a single amino acid in the fibrinogen A α chain and do not seem to affect fibrinogen's clotting activity.

Chromosomal Location

Cytogenetic Location: 4q31.3, which is the long (q) arm of chromosome 4 at position 31.3

Molecular Location: base pairs 154,583,126 to 154,590,766 on chromosome 4 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- Fib2
- FIBA_HUMAN

- fibrinogen alpha chain isoform alpha-E preproprotein
- fibrinogen alpha chain isoform alpha preproprotein
- fibrinogen, A alpha polypeptide

Additional Information & Resources

Educational Resources

- Biochemistry (5th Edition, 2002): Fibrinogen is Converted by Thrombin into a Fibrin Clot
<https://www.ncbi.nlm.nih.gov/books/NBK22589/#A1402>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28FGA%5BTIAB%5D%29+OR+%28fibrinogen+alpha+chain%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+NOT+%28microsatellite%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D>

OMIM

- AMYLOIDOSIS, FAMILIAL VISCERAL
<http://omim.org/entry/105200>
- FIBRINOGEN, A ALPHA POLYPEPTIDE
<http://omim.org/entry/134820>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
http://atlasgeneticsoncology.org/Genes/GC_FGA.html
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=FGA%5Bgene%5D>
- HGNC Gene Family: Endogenous ligands
<http://www.genenames.org/cgi-bin/genefamilies/set/542>
- HGNC Gene Family: Fibrinogen C domain containing
<http://www.genenames.org/cgi-bin/genefamilies/set/554>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=3661

- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/2243>
- UniProt
<http://www.uniprot.org/uniprot/P02671>

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